DWARFISM WITH RETINAL ATROPHY AND DEAFNESS

BY

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The two children with this dystrophy, a girl aged seven years and eleven months and a boy aged six years and three months were admitted to the Hospital for Sick Children, Great Ormond Street, in June, 1935. The parents, who are natives of north Hampshire, are of English race, normal and not blood-relations, and they have been unable to trace the occurrence of the condition in their ascendants or collaterals. Dr. N. F. Kendall, under whose care they were before admission, has ascertained that before marriage the parents lived sixteen miles apart, and as their families have lived in the neighbourhood for a long time it is not unlikely that there has been intermarriage between them some generations back. There are four older children, three girls, aged eighteen, fifteen, and twelve years respectively, and a boy, aged ten, and one younger, a boy aged three years, who is taller than either of the affected ones. The dwarfs are so much alike in facial appearance, build and disposition, that the same general description will suffice (fig. 1, 2). Both have small heads, that of the girl being the smaller (fig. 3), but, although the vault of the skull is flattened and the circumference small, the general shape is normal, and neither child has the receding forehead characteristic of microcephaly. Their faces are small with sunken eyes and prominent superior maxillae. They are slightly built with short, slender trunks and unduly long legs, and their feet and hands are too large in proportion. The third and fourth fingers of their hands are deviated a little towards the mesial line.

Both are active and their movements are quick and bird-like. They are friendly and playful, invariably good tempered, and laugh with obvious enjoyment at the slightest provocation. Although they are imitative, they have a certain amount of initiative and in playing with toys are no more destructive than most children of their age and class. They frequently make noises which at first sound like speech, but actual words can seldom be recognized, although the girl has been heard to say ' mother ' and ' do it again ' and the boy has said ' doctor ' several times. They do not answer to their names or obey spoken words nor do they take any notice of a sound made behind their heads, but they are quick to obey signs. Mr. James Crooks, F.R.C.S., who saw them, says that although not totally deaf, their hearing is greatly impaired. It is difficult to tell how much of their backwardness is due to deafness and how much to mental deficiency. Their

behaviour is not the usual behaviour of deaf children. They appear to be a little below the average in intelligence and are far more excitable and laugh much more readily than children of normal mentality whether deaf or not.

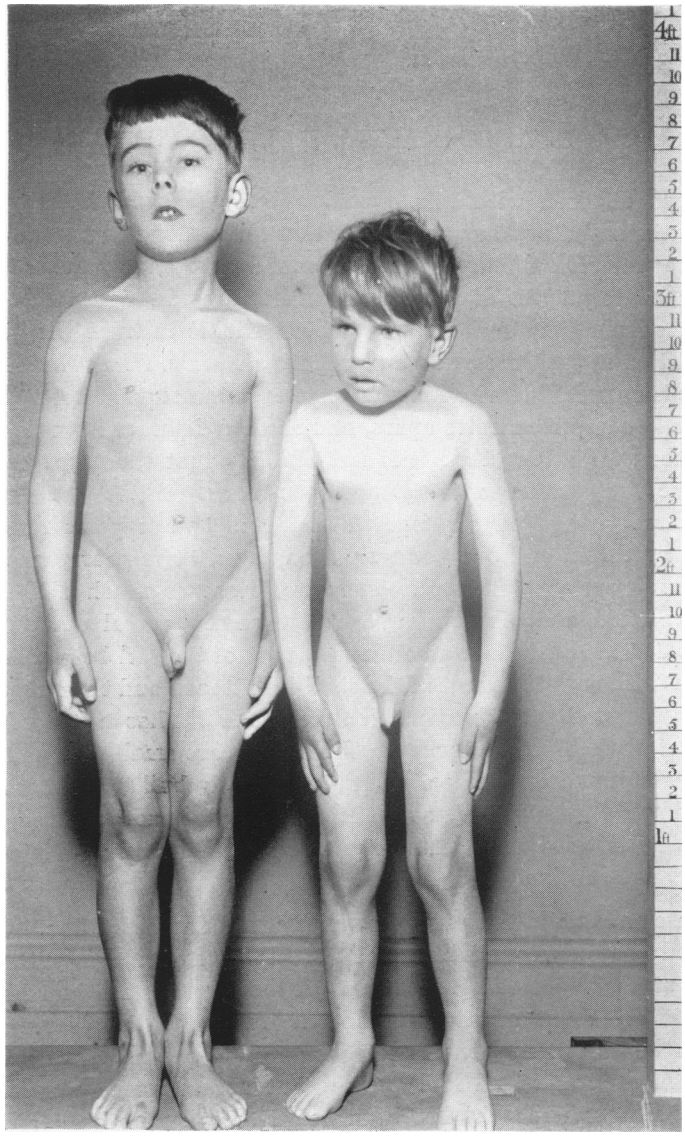

FIG. 1.—David D. with boy of same age.

Both have a scaly, erythematous dermatitis on the dorsum of the hands and wrists, on the legs, and on the face and ears, which according to the mother is worse after exposure to sun or wind, and their hands and feet are cold even in hot weather. Dr. R. T. Brain considers that the rash is trophic.

X-ray pictures of the skeleton show that their skulls are similar in shape with the vault low, but in the girl the vault is greatly thickened (fig. 4), whereas in the boy it is only a little thicker than normal. In the girl the

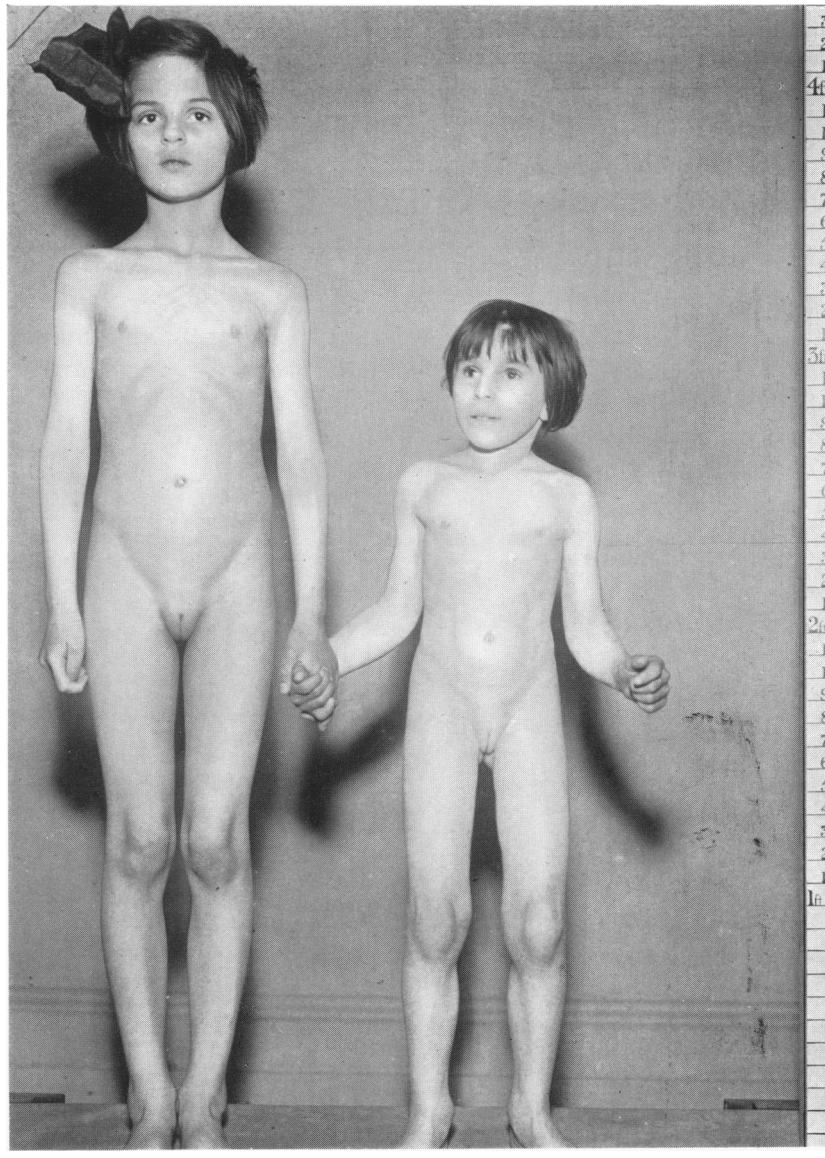

FIG. 2.—Pearl D. with girl of same age.

floor of the pituitary fossa is raised in the middle, and in the boy it is of the normal shape, but in both the fossa is unusually small. The vertebrae, long bones, and the bones of the hands and feet are of normal conformation and density in both children.

Appearances of the Eyes.

Mr. Arnold Sorsby, F.R.C.S., has kindly carried out an ophthalmological examination of the children and written the following report:—

THE EXTERNAL APPEARANCES of both children show that the eyes are normal in size and position. Ocular movements are full. Parallelism is not disturbed. There is no nystagmus. The globes appear to be sunken, probably as a result of the prognathism of the superior maxillae.

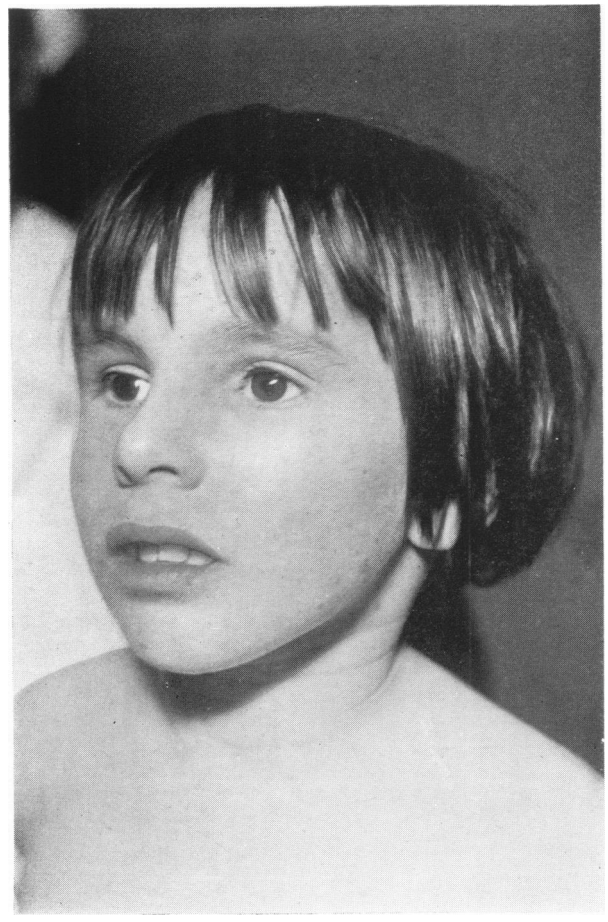

FIG. 3.—Pearl D. Head.

THE MEDIA are clear.

THE FUNDI show the following (fig. 5):—

DISCS. Considerable atrophy of the waxy type seen in retinal optic atrophy.

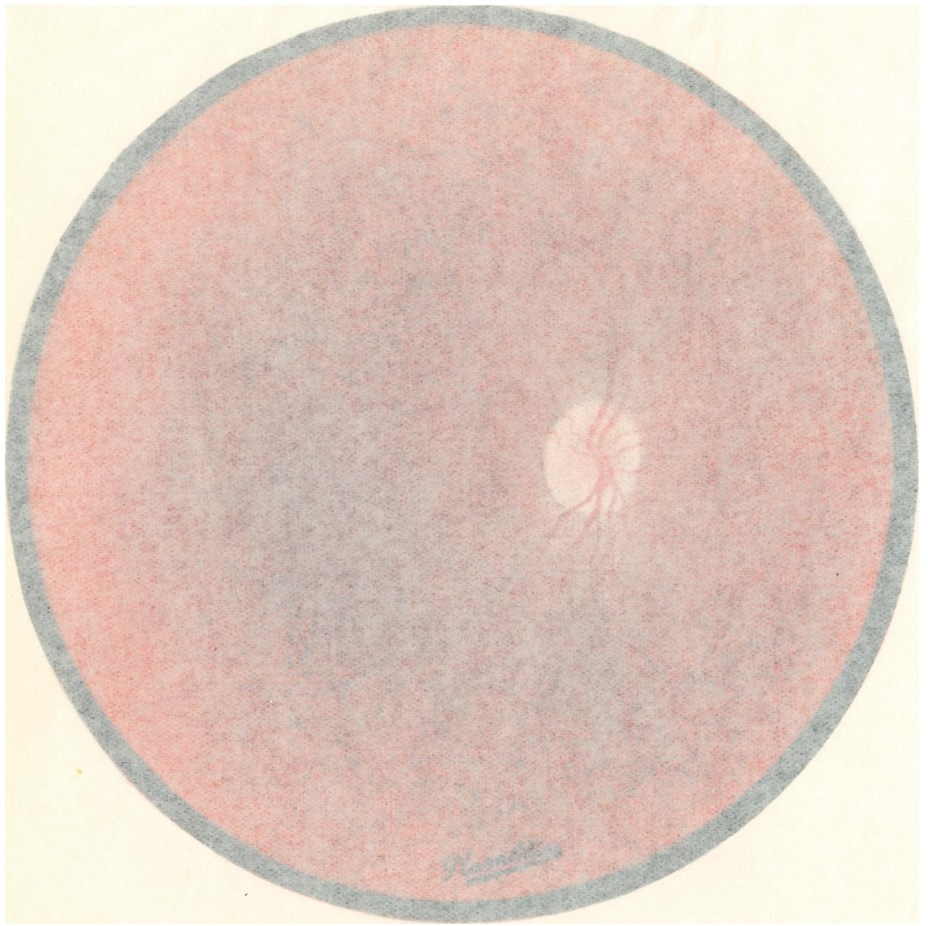

Fig. 5(a). Paul D.

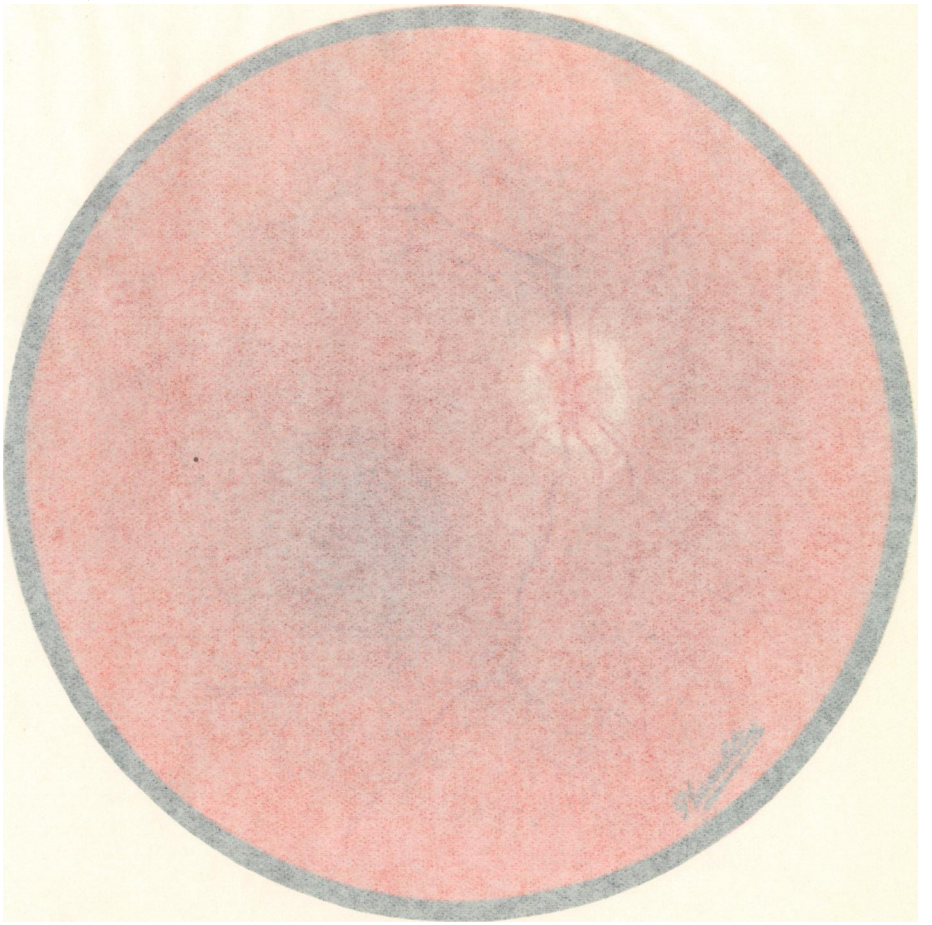

Fig. 5(b). David D.

Dwarfism with retinal atrophy.

VESSELS. The arteries markedly narrowed, and veins are hardly affected. The background is dull-red in colour. The choroidal pattern is not seen. The macular reflex is absent. Scattered all over the fundus, but particularly aggregated towards the central areas, are a number of fine blackish dots like those seen in ' salt and pepper fundus,' but differing from the classical picture in the distinct and symmetrically heavier involvement of the central areas. Nowhere does the pigmentary disturbance tend to follow the blood vessels.

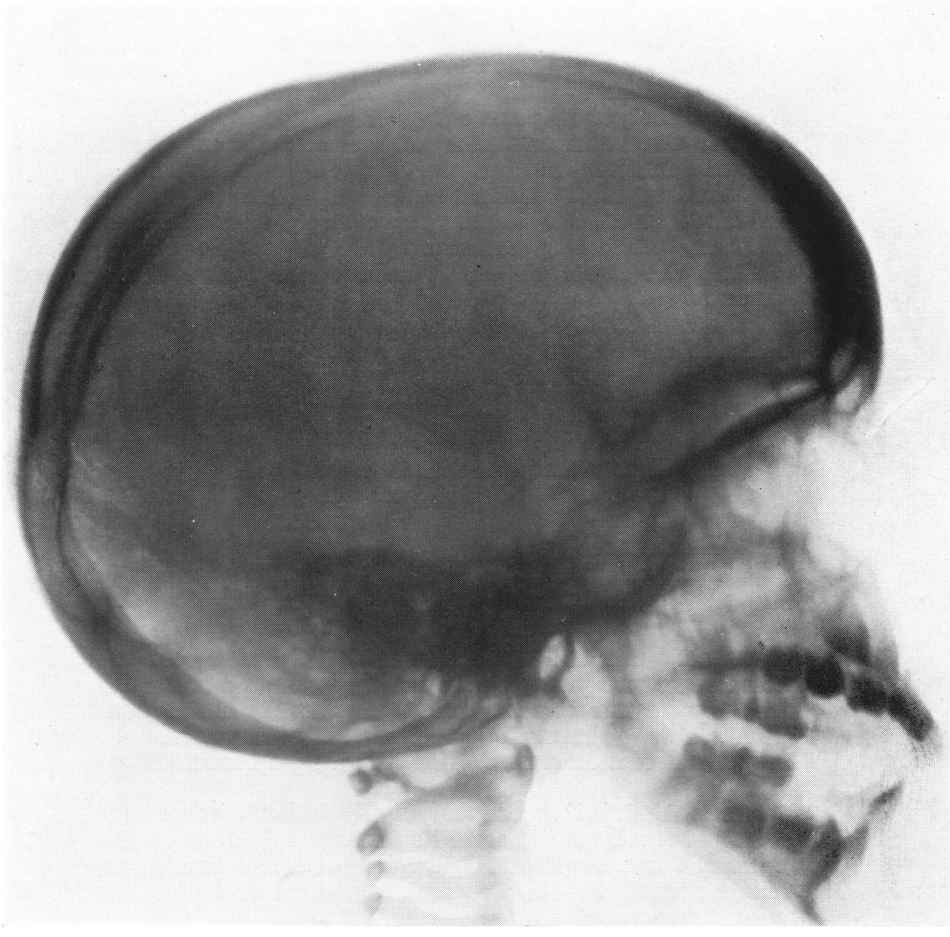

FIG. 4.—Pearl D. Skull, small, with thick bones.

The appearances in the two children are identical, except that the pigmentary disturbances are greater in the case of the boy.

The fundi are characteristic of extensive retinal atrophy with scattering of pigment. The absence of any definite choroido-retinal lesions and the symmetry would exclude congenital syphilis, the only condition requiring differential diagnosis from retinal atrophy. Their vision by day is good and they appear to have no night blindness, but no accurate test could be carried out. The visual fields could not be mapped out.

Detailed investigations.

The following is an account of details in the history, physical condition, and of investigations carried out on the two children.

Pearl D., seven years and eleven months, weighed $5\frac{3}{4}$ lb. at birth, started ' talking ' at eighteen months, walked at three-and-a-half years. She has just started school, to which she has to walk two miles, but her attendance is irregular. Growth has always been slow. The appetite is poor. Her hair is dark brown, the eyes brown.

Height, 37 in. Weight, 27 lb. Circumference of head, $17\frac{3}{8}$ in.; of chest, $18\frac{5}{8}$ in.; and of abdomen, 17 in. Circumference of hands at base of thumb, 6 in.; length of hand, 5 in.; of arm, 17 in.; of foot, $6\frac{1}{2}$ in.; and of leg, 20 in.

The teeth comprise four lower incisors and two canines (second dentition), normal. Teeth of first dentition are carious.

W.R. negative; Kahn reaction negative.

Blood urea, 38 mgm. per cent.; non-protein nitrogen, 32 mgm. per cent.; cholesterol, 173 mgm. per cent.; blood calcium, 11·9 mgm. per cent.; and blood phosphorus, 3·9 mgm. per cent.

Fasting blood sugar, ·078 per cent. After 5 minims of adrenalin the blood sugar figures were:—

After 20 minutes	...	...	·142 per cent.
,, 40 ,,	...	...	·108 ,, ,,
,, 60 ,,	...	...	·107 ,, ,,

UREA EXCRETION (urea concentration test).

	UREA PER CENT.	VOL. OF URINE C.C.
Before urea	2·65	68
After 1st hour ...	2·24	8
,, 2nd hour ...	2·42	18
,, 3rd hour ...	1·52	21

David D., six years and three months. Weighed $8\frac{1}{2}$ lb. at birth. He stood at two years and walked at two-and-a-half years. He had only become clean in habits ten months before admission. He has always grown slowly. The testes are undescended, and the penis is of normal size. The hair is light brown and the eyes blue.

Height, $37\frac{1}{2}$ in. Weight, 39 lb. Circumference of head, 19 in.; of chest, 20 in.; and of abdomen, $18\frac{1}{2}$ in. Circumference of hand, 6 in.; length of hand, 5 in.; of arm (shoulder to tip of middle finger), $16\frac{1}{2}$ in.; of foot, $5\frac{1}{2}$ in.; and of leg (external malleolus to anterior superior spine), $18\frac{1}{2}$ in.

Teeth (first dentition) are carious, but otherwise normal.

W.R. negative.

Blood urea, 38 mgm. per cent.; plasma albumin, 4·18 per cent.; globulin, 1·93 per cent.; fibrin, 0·33 per cent.; total nitrogen, 6·44 per cent.; non-protein nitrogen, 32 mgm. per cent.; blood cholesterol, 198 mgm.; calcium, 11·3 mgm.; phosphorus, 4·3 mgm. per cent.

Fasting blood sugar, ·072 per cent. After 5 minims of adrenalin the blood sugar figures were:—

After 20 minutes	...	...	·093 per cent.
,, 40 ,,	...	...	·124 ,, ,,
,, 60 ,,	...	...	·121 ,, ,,

UREA EXCRETION (urea concentration test).

	UREA PER CENT.	VOL. OF URINE C.C.
Before urea	4·45	80
After 1st hour ...	4·80	12
,, 2nd hour ...	3·46	17
,, 3rd hour ...	3·49	16

Discusssion.

I have been unable to find a report of any similar case, and Mr. Sorsby, who is well acquainted with the literature of developmental and degenerative conditions of the retina can give me no reference to a parallel case. The condition seems to be most closely akin to retinitis pigmentosa with deafness, but, though the deafness in this syndrome varies from partial deafness to deaf-mutism, the retinal changes are different. In Usher's[4] series of cases pepper-like pigmentation was present in a few, but was accompanied by moss-like pigment or by the more typical pigmentation like bone corpuscles in shape. Even in these cases, no. 7, 12, 13, and 24, where there was more than one affected child in the sibship, the pepper-like pigmentation was only present in one sib, that in the others being typical, and in two of these families there was no deafness associated with the retinitis pigmentosa. Julia Bell[1] in her monograph in the Treasury of Human Inheritance includes a family with two affected members reported by Dering (no. 180). The fathers were brothers and the mothers were aunt and niece. One cousin had diffuse pigmentation reaching to the papilla, the retinal vessels were narrowed, and there was a posterior polar cataract in each lens. In the other cousin there were streaks of pigment in the retina. Hepburn[2] describes a brother and sister with retinitis pigmentosa and no deafness. In the brother most of the pigment was of the peppery variety, though typical masses shaped like bone corpuscles were present also. The brother had cold hands and feet and the sister had cold hands, but no mention is made of any dystrophic condition of the skin.

Nettleship[3] in his comprehensive paper, for which he consulted the early literature in addition to analyzing his own long series of cases of retinitis pigmentosa, gives a list of anomalies found in association with it, but dwarfism is not amongst them. Julia Bell in her monograph also mentions all the abnormalities that have been found in people with retinitis pigmentosa. There is no case of dwarfism or reduction in size with increase in thickness of the skull, but cold hands and feet are mentioned by a few authors. Mental deficiency is not uncommon, but people with retinitis pigmentosa who are mentally deficient are usually feeble minded or dull, and if they have any alteration in temperament they are morose. Thus their mentality is very unlike that of these two children.

Retinitis pigmentosa with deafness resembles the syndrome described in this paper not only clinically but also in its familial incidence, and is inherited as a recessive, since 40·2 per cent. of the cases have consanguineous parents. It is rare, for only 3·3 per cent. of Nettleship's cases of retinitis pigmentosa were associated with deafness and only 4 per cent. of deaf-mutes out of 1,229 institutional cases were found to have retinitis pigmentosa. In some respects the syndrome resembles juvenile amaurotic idiocy but the pigmentation of the retina is more uniform and widespread, the mentality is different, and dwarfism has not been found in association with amaurotic idiocy.

REFERENCES.

1. Bell, J., *Treasury of Human Inheritance*, London, 1922, II, pt. 1.
2. Hepburn, M. L., *Roy. Lond. Ophth. Hosp. Rep.*, London, 1908, XVII, pt. 2, 238.
3. Nettleship, E., *loc. cit.*, 343.
4. Usher, C. H., *ibid.*, 1914, XIX, pt. 2, 130.